CLAIMS

[Claim(s)]
[Claim 1]It is said fixed board so that a fixed electrode may be formed in the surface of an insulating fixed board and said fixed electrode may be countered.
A movable electrode.
Before being a manufacturing method of a capacity type semiconductor dynamic quantity sensor provided with the above, and contacting said both boards, while flowing in said fixed electrode, A short circuit current carrying part located in a junction area where said both boards contact was provided in the surface of said fixed board, and after [said] carrying out anode joining, it was made for the part to raise cutting or resistance in said short circuit current carrying part.

[Claim 2]Said short circuit current carrying part comprises said fixed electrode and an identical material, and is made to carry out pattern formation simultaneously, A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 1 sending current after said anode joining at said short circuit current carrying part, and disconnecting said short circuit current carrying part by generation of heat based on it.
[Claim 3]When said short circuit current carrying part forms with material which deteriorates or is easy to be blown out and heats said short circuit current carrying part after said anode joining rather than said fixed electrode, A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 1 characterized by making it said short circuit current carrying part raise cutting or resistance.
[Claim 4]A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 1 disconnecting said short circuit current carrying part when said short circuit current carrying part makes said semiconductor substrate contact in portions other than a chip formation region on a wafer and carries out dicing of said wafer.
[Claim 5]A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 2 or 3 forming thinly said a part of short circuit current carrying part.
[Claim 6]A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 2 or 3 covering said short circuit current carrying part with an insulator layer.
[Claim 7]A manufacturing method of the capacity type semiconductor dynamic quantity sensor according to claim 2 or 3 covering said short circuit current carrying part and said fixed electrode with an insulator layer.

[Claim 8]A capacity type semiconductor dynamic quantity sensor characterized by a thing through which provide a short circuit electric conduction pattern characterized by comprising the following, and it was made for said fixed electrode and a semiconductor substrate to flow via said short circuit electric conduction pattern at the time of anode joining.
A fixed board in which a fixed electrode was provided.
A gap which flows at the time of high voltage impression for anode joining, and is un-flowing in a capacity type semiconductor dynamic quantity sensor which anode joining of the semiconductor substrate was carried out, and was unified at the time of the usual dynamic quantity measurement.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a capacity type semiconductor dynamic quantity sensor and a manufacturing method.
[0002]
[Description of the Prior Art]Drawing 1 and drawing 2 show an example of the conventional capacity type acceleration sensor. As shown in the figure, the glass substrate 2a and 2b are arranged to up-and-down both sides of the silicon semiconductor substrate 1. And both the boards 1 and 2a and 2b are joined by the anode joining method in the periphery S.
[0003]The silicon semiconductor substrate 1 is formed so that the cantilevered suspension of the weight part 4 may be carried out by etching processing via the beam part 5 to the frame-like buck 3. It is thinner than the buck 3 so that displacement of the weight part 4 may be attained, and specifically, elastic support of the displacement of it is made possible up and down in the center of an inner periphery of the buck 3 via the beam part 5 which has elasticity.
[0004]Up-and-down both sides of this weight part 4 serve as a movable electrode, make this movable electrode counter, and the upper part fixed electrode 7a is formed in the inner surface of the upper glass substrate 2a, The bottom fixed electrode 7b (a "fixed electrode" is only called hereafter in the part which does not need to distinguish the upper part fixed electrode 7a and the bottom fixed electrode 7b) is formed in the inner surface of lower glass substrate 2b.
[0005]And the electric capacity according to a gap occurs between a movable electrode and a fixed electrode. Therefore, when acceleration is added, the beam part 5 bends, in order that the weight part 4 may move, the above-mentioned gap changes, and the electric capacity generated between two electrodes also changes. And it asks for change of a gap, i.e., acceleration, by detecting change of the electric capacity.
[0006]The structure for taking out change of the electric capacity outside is as follows. First, since the silicon semiconductor substrate 1 has conductivity, the movable electrode side will be in switch-on to the buck 3 currently united with the weight part 4. Then, the conductive thin film 9a which formed the through hole 8a in the prescribed position of the fixed electrode 2a which is an insulator as shown in drawing 1, and was formed in the surface of the glass substrate 2a via the through hole 8a is made to flow. And it becomes connectable with an external circuit with the wire (not shown) by which bonding was carried out to the conductive thin film 9a.
[0007]Similarly, as shown in drawing 2, it pulls out succeeding the bottom fixed electrode 7b, and the lead part 10 of business is formed. On the other hand, the reverse truncated pyramid-like block part 11 is formed in the prescribed position in the buck 3 of the silicon semiconductor substrate 1 which counters the tip part of the lead part 10. And this block part 6 is contacted to the above-mentioned lead part 10 on that bottom while it separates mutually electrically with the buck 3. The through hole 8b which formed the upper surface of the block part 11 in the glass substrate 2a is made to contact furthermore. Thereby, the bottom fixed electrode 7b flows in the conductive thin film 9b formed in the surface of the glass substrate 2a via the lead part 10, the block part 11, and the through hole 8b. And it becomes connectable with an external circuit with the wire (not shown) by which bonding was carried out to the conductive thin film 9b.

[0008]Although a graphic display abbreviation is carried out, the upper part fixed electrode 7a formed in the upper glass substrate 2a also flows via the through hole formed in the glass substrate 2a in each above-mentioned conductive thin films 9a and 9b and the conductor thin film formed in the insulating state, and is connected to an external circuit.

[0009]By the way, in manufacturing this acceleration sensor. After forming the state where the buck 3, the weight part 4, and the block part 11 are not probably separated thoroughly into the silicon semiconductor substrate 1 by electrochemical etching etc., glass substrate 2b is joined to the silicon semiconductor substrate 1 by an anode joining method. Then, by etching, the beam part 5 is formed, the weight part 4 is separated, and displacement is made possible. After separating the block part 11 from the buck 3 furthermore, an acceleration sensor is produced by joining the silicon semiconductor substrate 1 and the glass substrate 2a by an anode joining method.

[0010]Under the present circumstances, after the anode joining of the silicon semiconductor substrate 1 and the glass substrate 2a enables displacement of the weight part 4, it must be joined, and the weight part 4 whose displacement was attained approaches with the fixed electrode 7a or 7b formed in one glass substrate 2a or 2b of electrostatic attraction in the case of junction. And there is a possibility that one fixed electrode may contact the weight part 4 with electrostatic attraction, or one [the weight part 4 and] fixed electrode may alloy and weld with heat. When the starting situation was produced, even if acceleration was added, it would not be displaced, and the electric capacity between the weight part 4 and a fixed electrode did not change by this, but the weight part 4 had a fault of it becoming impossible to detect acceleration.

[0011]In order to solve the starting problem, it is similar with the above-mentioned acceleration sensor, and there is an invention indicated by JP,4-6888,B as conventional technology of the pressure sensor which is the same target technical field [this invention]. This invention forms the portion (crevice) 13 to which a large number became depressed on the surface (opposed face with glass substrate 2') of silicon wafer 1' on a lattice-like intersection, as shown in drawing 3 - drawing 5. The fixed electrode 14 is formed in the surface of glass substrate 2' which counters the crevice 13. And where silicon wafer 1' and glass substrate 2' are joined, as shown in drawing 5, the crevice 13 will constitute the pressure chamber in a final semiconductor pressure sensor.

[0012]Subsequently, while connecting silicon wafer 1' to the anode of the power supply for anode joining, glass substrate 2' is connected to the negative electrode of the power supply for anode joining, and predetermined voltage is impressed among two poles in the state. Thereby, current is sent between silicon wafer 1' and glass substrate 2', and uniting (anode joining) of the contacting parts is carried out. Thus, after carrying out anode joining, many sensor chips are separated and started by cutting in length and a transverse direction.

[0013]Here, the through hole 15a through which it flows in the fixed electrode 14 before joining, as expanded and shown in drawing 4, and the through hole 15b through which it flows in silicon wafer 1' are formed in the prescribed position of glass substrate 2'.

[0014]And when carrying out anode joining, as first shown in drawing 5, the pin 17 is contacted to each through hole 15a connected to each fixed electrode 14, respectively. Each of this pin 17 is connected to the anode of the power supply for anode joining. If anode joining is carried out in this state, the through hole 15a in contact with each pin 17 and the fixed electrode 14 will become the potential of the level mostly with the predetermined positive potential impressed to the silicon wafer 1' side at the time of anode joining. Therefore, since there is almost no potential difference of the fixed electrode 14 and

silicon wafer 1' (bottom of the crevice 13) and it opposes mutually, contacting and welding is lost.
[0015]
[Problem(s) to be Solved by the Invention]In the above-mentioned conventional method, although a fixed electrode and a weight part can be prevented from welding at the time of anode joining, the problem newly shown below is produced. That is, the device for the wiring for connecting with a power supply, etc. being needed, and carrying out anode joining of jigs, such as a pin for using same electric potential, and the pin of those from the exterior, is enlarged. And in order to have to perform anode joining in the state where it was contacted certainly in the through hole which corresponds each pin of the jig, highly precise assembling precision is required and it becomes complicated [manufacture of the device to apply]. If it is complicated to operate the device for carrying out anode joining and contact of a pin will not be enough, holding the state where it was made to contact with a jig such, it will not be able to maintain at same electric potential, but the above-mentioned problem will be generated, and generating of inferior goods will be caused.
[0016]In order to contact each through hole and the pin 17 certainly, While making possible mutually rise and fall movement of each pin 17 independently, the mechanism pushed against the through hole side by a predetermined pressure with a spring etc. as the gazette was also indicated becomes indispensable, It will become what has the complicated and expensive composition of a jig conjointly that it is also necessary to short-circuit each pin itself mutually.
[0017]In order to contact a pin to all the fixed electrodes, it necessary, many pins are dramatically needed, and the structure of a jig complicates the number of pins more. [which are manufactured from at least one wafer] [a chip number and] [same number] Although a jig including a pin must also be miniaturized with the miniaturization of a sensor, there is a limit in it. As a result, the limit of a miniaturization of a sensor arises from the request by the side of a device, and it becomes a neck when attaining the further miniaturization of sensor shape. To the sensor of a different kind, arrangement of the above-mentioned pin, etc. must be changed according to the layout on a wafer, and flexibility is missing.
[0018]Since it is connected [silicon wafer 1' and the fixed electrode 14] to the positive pole terminal of the same power supply, although same electric potential is served as mostly, they are not necessarily short-circuited directly and do not necessarily become same electric potential thoroughly. And if there is a part where potential difference becomes large selectively, the chip in the portion will serve as inferior goods for the same reason as the conventional problem.
[0019]The place which this invention was made in view of the above-mentioned background, and is made into the purpose, Solve the above-mentioned problem and the special jig for making the fixed electrode and semiconductor substrate (movable electrode) side into same electric potential is made unnecessary, It is in providing the capacity type semiconductor dynamic quantity sensor and manufacturing method which can respond to a sensor of a different kind, can be adapted also for the miniaturization of a sensor chip, can make it same electric potential by each tip part certainly, and can manufacture a sensor with small characteristic dispersion.
[0020]
[Means for Solving the Problem]In order to attain the above-mentioned purpose, in a manufacturing method of a capacity type semiconductor dynamic quantity sensor concerning this invention. While contacting said fixed board and a semiconductor substrate which has a movable electrode so that a fixed electrode may be formed in the surface of an insulating fixed board and said fixed electrode may be

countered, It was made to perform the two following steps on the assumption that a manufacturing method of a capacity type semiconductor dynamic quantity sensor including a process which is made to impress and carry out anode joining of the anode joining voltage, and is unified among both substrates (claim 1).

[0021]Before contacting [predetermined timing before the 1st carries out step anode joining] said both substrates, while flowing in said fixed electrode, the part provides a short circuit current carrying part located in a junction area where said both boards contact in the surface of said fixed board. This short circuit current carrying part can also be simultaneously formed, when carrying out pattern formation of the same member as a fixed electrode, i.e., the fixed electrode, (claim 2). In this case, in an embodiment, it is equivalent to the short circuit electric conduction pattern 23, 23', and 23 ". It may constitute from a separate member (claim 3). According to an embodiment equivalent to this, it is equivalent to the short circuit conductor 27.

[0022]It is made for said short circuit current carrying part to raise cutting or resistance to predetermined timing after the 2nd carries out step anode joining. Usually, although a semiconductor dynamic quantity sensor to apply forms many tip parts on a wafer, it cuts in length and a transverse direction eventually (dicing) and it separates into a sensor chip in every piece, this 2nd step may be performed in a stage of a wafer before starting cutting, or may be performed for every chip after cutting.

[0023]In this invention, when carrying out anode joining, a fixed electrode is connected with a semiconductor substrate (movable electrode) by short circuit current carrying part, and a movable electrode and a fixed electrode serve as same electric potential. Therefore, when carrying out anode joining, two electrodes do not contact with electrostatic attraction and do not alloy, either. And, for example after an end of junction, this short circuit current carrying part sends current through a short circuit current carrying part by applying high tension to the external connection inter-electrode of an external connection electrode of a fixed electrode, and a movable electrode etc., this short circuit current carrying part is blown out by generation of heat then produced, or is deteriorated and raises resistance. Thereby, a movable electrode and a fixed electrode are made to separate electrically. Therefore, detection of dynamic quantity, such as acceleration and a pressure, can be obtained like the conventional various sensor. When deteriorating especially a short circuit current carrying part, even if it heats using a heating method, same operation effect is obtained.

[0024]When said short circuit current carrying part makes said semiconductor substrate contact in portions other than a chip formation region on a wafer and carries out dicing of said wafer as another solving means for attaining the above-mentioned purpose, it may be made to disconnect said short circuit current carrying part (claim 4).

[0025]If it has starting composition, dicing treatment separated from a wafer for every sensor chip and cut treating of a short circuit current carrying part can be made to make it serve a double purpose. Therefore, processing at a manufacturing process number or each process can also be performed as usual only by changing a mask pattern used at the time of patterning of a fixed electrode etc., and etching to a semiconductor substrate, and it becomes unnecessary [change of a manufacturing facility].

[0026]And it is forming thinly said a part of short circuit current carrying part preferably (claim 5). Since current and voltage will concentrate on the portion which became thin when current is sent through a short circuit current carrying part for cutting if it has starting composition, a rise of resistance by cutting or deterioration of a short circuit current carrying part can attain easily.

[0027]said short circuit current carrying part -- an insulator layer -- a wrap -- making it like **** --

(claim 6), said short circuit current carrying part, and said fixed electrode -- an insulator layer -- a wrap -- like -- carrying out (claim 7) -- it is more desirable. When it has starting composition, after an end of junction by for example, means, such as applying high tension to the external connection inter-electrode of an external connection electrode of a fixed electrode, and a movable electrode. When cutting or deteriorating this short circuit current carrying part and raising resistance, scattering and generating of a fragment in which a short circuit current carrying part was disconnected, or outgas produced in the case of deterioration can be suppressed. And since the fixed electrode side also exists [an insulator layer] in inter-electrode with an insulator layer in addition to a wrap and the above-mentioned operation, even if it is not able to ensure a short circuit, there will be no possibility that a movable electrode and a fixed electrode which counter may carry out direct contact, and an insulation of two electrodes will be taken certainly.

[0028]In a capacity type semiconductor dynamic quantity sensor concerning this invention as an another-solution conclusive factor stage for on the other hand attaining the above-mentioned purpose. In a capacity type semiconductor dynamic quantity sensor which anode joining of a fixed board in which a fixed electrode was provided, and the semiconductor substrate was carried out, and was unified, It flowed at the time of high voltage impression for anode joining, and a short circuit electric conduction pattern which has a gap which is un-flowing at the time of the usual dynamic quantity measurement is provided, and it was made for said fixed electrode and a semiconductor substrate to flow via said short circuit electric conduction pattern at the time of anode joining (claim 8).

[0029]In a sensor of starting structure, at the time of anode joining, since high tension is impressed, as it flows through the surface of a fixed board, an electron flies and current flows between gaps. Therefore, since two electrodes become same electric potential mostly, contacting of them with electrostatic attraction is lost. On the other hand, in the time of the usual sensor use after anode joining, voltage generated between gaps is small and current does not flow. Therefore, since it will be in an insulating state between two electrodes, a signal based on electric capacity generated between two electrodes can be outputted outside. That is, in this composition, after anode joining, a short circuit current carrying part is disconnected, or insulation-ized processing in which it is made to deteriorate becomes unnecessary, and it can respond according to the same manufacturing process (what is necessary is just to change a mask pattern at the time of generating a fixed electrode) as usual.

[0030]

[Embodiment of the Invention]Drawing 6 and drawing 7 show a 1st embodiment of this invention. Drawing 6 shows the glass substrate 20 corresponding to one sensor chip portion, and in a actual manufacturing process, as shown in drawing 3, the field corresponding to the above-mentioned glass substrate 20 is assigned by each part of the surface of a big glass substrate. And at the usual process, the fixed electrode 21 and the lead part 22 which consist of specified pattern shape by vacuum evaporation or weld slag are first formed in the junction side surface of this glass substrate 20 simultaneously (refer to drawing 6).

[0031]As it is pulled out from the fixed electrode 21 simultaneously with it in the case of the process of manufacturing the above-mentioned fixed electrode 21 grade, he is trying to form the short circuit electric conduction pattern 23 by this invention here. And he is trying to locate the tip part 23a of this short circuit electric conduction pattern 23 in the buck by the side of the silicon semiconductor substrate of a graphic display abbreviation, and the junction area (field of the outside of a dashed dotted line) 24 of the glass substrate 20.

[0032]Thus, only by changing vacuum evaporation / pattern shape at the time of carrying out weld slag, each other manufacturing processes can perform predetermined metal on the surface of the glass substrate 20 like the conventional thing. That is, to a silicon semiconductor substrate (wafer), a buck, a weight part, a beam part, etc. are formed by etching. And as the column of the Prior art also explained, the relative position is doubled and the silicon semiconductor substrate and the glass substrate 20 to apply are contacted.
[0033]Then, the tip part 23a of the short circuit electric conduction pattern 23 contacts a silicon semiconductor substrate. This short-circuits electrically the fixed electrode 21 and a movable electrode (formed in a weight part) via the short circuit electric conduction pattern 23 and a silicon semiconductor substrate. Anode joining voltage is impressed between the glass substrate 20 and a silicon semiconductor substrate in this state, and anode joining of both the boards is carried out in the junction area 24.
[0034]Since a fixed electrode and a movable electrode are short-circuited and it has become same electric potential at this time, it becomes difficult to generate the potential difference between both. Contact by inter-electrode electrostatic attraction and welding by alloying of the electrodes accompanying discharge are lost by this at the time of anode joining.
[0035]And by giving predetermined down stream processing of anode joining and others as mentioned above, as shown in drawing 7, the glass substrate 20 is joined to up-and-down both sides of the silicon semiconductor substrate 25 provided with the weight part (movable electrode), and it unites with them. The three through holes 26a-26c penetrated up and down are formed in the prescribed position of the upper glass substrate 20. It has flowed through each through holes 26a-26c at each in the conductor thin films 27a-27c which dissociated mutually and were formed on the surface of the glass substrate 20.
[0036]And it flows through the through holes 26a and 26b, respectively in each fixed electrode formed in the up-and-down glass substrate, and they flow through the through hole 26c in the silicon semiconductor substrate 25.
[0037]Then, after carrying out anode joining, predetermined high tension is impressed, respectively among the conductor thin films 27a and 27c and among the conductor thin films 27b and 27c. Then, in the state immediately after carrying out anode joining, since a corresponding fixed electrode and movable electrode have flowed via the short circuit electric conduction pattern 23, current flows into the short circuit electric conduction pattern 23. And if a current value is carried out more than [a certain] fixed, the short circuit electric conduction pattern 23 will exhibit the same function as a kind of fuse, and will be blown out. Since the width of the short circuit electric conduction pattern 23 is dramatically small compared with the width by the side of the fixed electrode 21 and a silicon semiconductor substrate at this time, the resistance of that short circuit electric conduction pattern 23 is high compared with other portions, and the part concerned is blown out certainly.
[0038]Since inter-electrode is insulated eventually by this, it can function as a usual sensor after that. That is, if bonding of the wire is carried out to the three conductor thin films 27a-27c, the electric capacity between one fixed electrode and a movable electrode will be detected among the conductor thin films 27a and 27c, and the electric capacity between the fixed electrode of another side and a movable electrode will be detected among the conductor thin films 27b and 27c.
[0039]Blowout processing of the above-mentioned short circuit electric conduction pattern 23 may be performed on a wafer, or it may carry out, after cutting and separating into each chip shape. And since it is not necessary to send the current for blowing out simultaneously to all the tip parts which exist on a wafer also when carrying out on a wafer, the structure of the device for sending the current for

[starting] blowing out can be simplified. That is, when the number of pins can also be lessened and it is made to energize for every tip part of a predetermined number, it can respond also to the sensor chip of a different kind, and will be rich in flexibility.

[0040]Drawing 8 shows the important section of a 2nd embodiment of this invention, and is a figure corresponding to drawing 6. At this embodiment, although it is the same as that of a 1st embodiment fundamentally, it differs in trying that short circuit electric conduction pattern 23' is pulled out from the lead part 22 of the fixed electrode 21.

[0041]It can manufacture by the same process as a 1st embodiment except changing the applied pattern shape. And at the time of anode joining, since the fixed electrode 21 is connected with the silicon semiconductor substrate (movable electrode) too hastily via the lead part 22 and short circuit electric conduction pattern 23', it is lost that between two electrodes contacts and unites. By impressing voltage between the conductor thin films connected to two electrodes, current flows in order of a lead part 22 -> short circuit electric conduction pattern 23'-> silicon semiconductor substrate (or the reverse), and after anode joining is made to blow out in a short circuit electric conduction pattern 23' portion, and aims at the insulation between two electrodes.

[0042]In order to make it blow out in the portion of short circuit electric conduction pattern 23' certainly, it is making width W2 of short circuit electric conduction pattern 23' smaller than the width W1 of the lead part 22 into which the current for making it blow out flows. Since the current for [above-mentioned] making it blow out does not flow into the lead part 22 by the side of the fixed electrode 21 rather than the connection section of the lead part 22 and short circuit electric conduction pattern 23', the width serves as unquestioned.

[0043]Drawing 9 shows the important section of a 3rd embodiment of this invention. This embodiment is the same as that of a 2nd embodiment, and he is trying to pull out short circuit electric conduction pattern 23" from the lead part 22 of the fixed electrode 21 fundamentally. As for it being different from a 2nd embodiment here, 23" of omitted portions of the short circuit electric conduction pattern 23" narrow width of b compared with other portions.

[0044]When the current for blowout is sent through short circuit electric conduction pattern 23" by having starting composition, in 23" of the omitted portion, an electric charge concentrates on b, and it blows out in the portion certainly (open circuit). If it puts in another way, the place of an open circuit can be set as arbitrary places. Since other processes are the same as that of each above-mentioned embodiment, they attach identical codes and omit the detailed explanation.

[0045]Drawing 10 shows a 4th embodiment of this invention. Although the short circuit electric conduction pattern was simultaneously formed with the identical material on the occasion of the pattern formation of a fixed electrode, he is trying to form by a separate member with a fixed electrode at this embodiment in each above-mentioned embodiment.

[0046]That is, the fixed electrode 21 and the lead part 22 are first formed using Ti/Pt so that it may illustrate. This process is the same as that of the conventional thing. Subsequently, the band-like short circuit conductor 27 is formed using aluminum which deteriorates at low temperature (oxidation) rather than the metal (Ti/Pt) in which the fixed electrode 21 grade was formed. And one end of this short circuit conductor 27 is contacted to the lead part 22, and the other end is located in the junction area 24.

[0047]In this state, the silicon semiconductor substrate formed separately is contacted and anode joining is carried out. Then, since silicon semiconductor substrate ****** connects the fixed electrode 21 with a movable electrode too hastily via the lead part 22 and the short circuit conductor 27 and it becomes same

electric potential, two electrodes are attracted and it does not contact.

[0048]And it performs insulating between the fixed electrode which counters after anode joining, and a movable electrode by heating the short circuit conductor 30 and deteriorating it (oxidation). That is, by oxidizing aluminum which constitutes the short circuit conductor 30, and making it an aluminum oxide, resistance is raised and it is made an insulating material. Thereby, electrically, between two electrodes, it dissociates and the function as a usual sensor is exhibited.

[0049]And as the above-mentioned method of heating, like blowout of the short circuit electric conduction pattern in the case of each above-mentioned embodiment, High tension can be impressed between two electrodes, high electric current can be sent through the short circuit conductor 30, and various methods, such as using generation of heat accompanying this energization, installing under a high temperature atmosphere, or laying on the heating method of a hot plate etc., can be taken. And in any case, since the fixed electrode 21 is thermally stable at Ti/Pt (comparing with aluminum), short circuit conductor 30 portion oxidizes first, and it is insulation-ized.

[0050]Since what is necessary is just to arrange the sensor chip itself in predetermined heating apparatus in this embodiment since the short circuit conductor 30 should just be heated and it is not necessary to energize to the short circuit conductor 30, Since the size and shape of a sensor chip are not asked while being able to process simultaneously to many sensor chips, an insulation process can be performed easily.

[0051]Drawing 11 shows a 5th embodiment of this invention. According to this embodiment, it was different from each above-mentioned embodiment, a distance narrow in the intermediate part of the short circuit electric conduction pattern 28 pulled out from the lead part 22 was separated, and the fixed electrode 21 and junction area 24 side is divided.

[0052]That is, as expanded and shown in drawing 12, the both ends 31a and 31b of the short circuit electric conduction pattern 31 are connected to the lead part 22 and the junction area 24, respectively. And the intermediate part 31c of the short circuit electric conduction pattern 31 is formed in the shape of [which set the slit very much and entered by turns] a ctenidium. And like a 1st and 2nd embodiment, the pattern to apply can be simultaneously formed, when forming fixed electrode 21 grade. That is, the process which it became independent of for forming the short circuit electric conduction pattern 31 becomes unnecessary.

[0053]Subsequently, the same manufacturing process as usual is performed, and anode joining is carried out. Then, excessive voltage is added to a fixed electrode and movable electrode inter-electrode at the time of this anode joining, and the big potential difference also between the ctenidium-like portions which the intermediate part 31c of the short circuit electric conduction pattern 31 approaches occurs. Then, current flows through the intermediate part 31c of the short circuit electric conduction pattern 31 which the electron was transmitted and left the surface of the glass substrate 20 physically. The fixed electrode 21 and a movable electrode will be in a short condition, inter-electrode voltage is reduced and inter-electrode contact and welding stop thereby, producing it.

[0054]After that usual processing is performed and a sensor chip is manufactured. Although processing for blowing out or deteriorating a short circuit electric conduction pattern and a short circuit conductor was performed by each above-mentioned embodiment at this time, it is not necessary to perform starting special processing in this embodiment. That is, since the inter-electrode voltage generated when using it as a usual sensor since the intermediate part 31c of the short circuit electric conduction pattern 31 is deserted and separated is small, current does not flow through the intermediate part 31c concerned.

Therefore, an insulating state is maintained between two electrodes and a sensor functions correctly.
[0055]therefore, the pattern shape of the mask at the time of forming a fixed electrode in this embodiment -- only changing (the short circuiting conductor pattern 31 is formed simultaneously) -- since other manufacturing processes can be performed as usual, the effect that it can be used as it is also does the conventional equipment so.
[0056]In the above-mentioned embodiment, although it dissociated in the intermediate part of the short circuit conductor pattern 31, this invention may not be restricted to this and the connection side edge part [with the lead part 22] 31a or end 31b side by the side of the junction area 24 may separate it. It may be made to also make the shape of the leaver section approach the portion which counters by one point, as it does not restrict in the shape of [above-mentioned] a ctenidium, for example, is shown in drawing 13. Thereby, it becomes easy to concentrate an electric charge on 31d of vertices portion of the triangle, and current can be certainly sent at the time of anode joining. Further again, as shown in each figure, even if a leaver section makes it linear shape rather than gives unevenness, it is easy to be natural [a leaver section].
[0057]Although the thing of the gap to describe above also pulled out the short circuiting conductor pattern 31 from the lead part 22 further again, it is easy to be natural even if it makes it pull out directly from the fixed electrode 21 side like a 1st embodiment.
[0058]Drawing 14 shows a 6th embodiment of this invention. This embodiment forms the protective film 34 which consists of insulating resin like polyimide so that the short circuit electric conduction pattern 23" may be covered on the basis of a 3rd embodiment that made narrow the omitted portion of short circuit electric conduction pattern 23". And where the protective film 30 is formed, anode joining is carried out, and when sending and blowing out current to short circuit electric conduction pattern 23" at an after that predetermined process, scattering of the fragment of the blowout and a short circuit electric conduction pattern when it cuts can be prevented. Therefore, it bars that a foreign matter (fragment of a short circuit electric conduction pattern) mixes in inter-electrode, and a sensor becomes poor.
[0059]And although the starting protective film 34 should just cover the portion blown out at least, he may be trying to cover it on the fixed electrode 21, as it is conversely indicated in drawing 15 as it. And it is good to use the fixed electrode 21 for a wrap case for a SiO_2 thin film etc., since the gap with a movable electrode is short.
[0060]If it has starting composition, the effect of preventing the inter-electrode contact at the time of junction by installation of a short circuit electric conduction pattern and welding can be made still higher (since the SiO_2 thin film which consists of insulators will exist between SiO2 two electrodes even if two electrodes approach). It bars that a sensor becomes prevent scattering of a fragment when it cuts further, and a foreign matter mixes in inter-electrode, and not to unite and poor.
[0061]It is applicable to what [all] blows out a short circuit electric conduction pattern (short circuit conductor) to provide the starting protective film.
[0062]Drawing 16 shows a 6th embodiment of this invention. According to this embodiment, a short circuiting conductor pattern is cut after anode joining, and it differs from each embodiment which the process of separating a fixed electrode and a movable electrode described above. That is, he uses the rectangular area surrounding [with a dashed dotted line] the chip formation region 35 on the glass substrate 20 first, and is trying to form the predetermined free space 36 between the adjacent chip

formation regions 35. This free space 36 is a field used as a garbage, when the glass substrate 20 is eventually cut in length and a transverse direction and it dissociates for every sensor chip. However, the portion of this free space 36 contacts a silicon semiconductor substrate, and anode joining is carried out.
[0063]And in this embodiment, on the glass substrate 20, by carrying out pattern formation of the predetermined metal membrane, as it pulls out from each of the fixed electrode 21 and the lead part 22, the short circuit electric conduction pattern 38 is formed. And the tip part 38a of each short circuit electric conduction pattern 38 is carrying out extended formation even in the above-mentioned free space 36. The starting conditions are not indispensable although it has connected also with the fixed electrode of the chip formation region 35 which adjoins under figure Nakagami in this example.
[0064]The silicon semiconductor substrate (silicon wafer) side is etched, and he faces forming a weight part, a beam part, a buck, etc., and is trying for the above-mentioned short circuit electric conduction pattern 38 and a silicon semiconductor substrate to become non-contact in the chip formation region 35. Specifically, the portion 35a corresponding to the short circuit electric conduction pattern 38 is removed to a concave. The short circuit electric conduction pattern 38 contacts the silicon semiconductor substrate which exists in the free space 36, a fixed electrode and a movable electrode flow through it, and he is trying to become same electric potential by this.
[0065]Therefore, since two electrodes become same electric potential when carrying out anode joining, it does not contact mutually and does not weld. This point is the same as that of each above-mentioned embodiment. And after passing through the usual various processing, the cutting process separated for every sensor chip is performed. Namely, a substrate is cut for every prescribed interval in all directions. The dashed dotted line top specifically shown in drawing 16 is cut. Thereby, one sensor chip as shown in drawing 17 is formed.
[0066]And in the state where it separated into the chip so that clearly from drawing 17 since the silicon semiconductor substrate and the short circuit electric conduction pattern 38 were formed in the noncontact state in the silicon formation area. The short circuit electric conduction pattern 38 will not contact a silicon semiconductor substrate (joined to the glass substrate 20 in the field shown by hatching), but will be in an insulating state between a fixed electrode and a movable electrode. Therefore, it functions as a usual sensor.
[0067]According to this embodiment, since the process for separating between two electrodes was used also [cut treating / which is performed from the former / of a wafer], as a manufacturing process, the conventional thing which has other fundamental composition can be used as it is only by changing pattern shape compared with the conventional thing.
[0068]At the above-mentioned embodiment, although the short circuit electric conduction pattern 38 was pulled out from both the fixed electrode 21 and the lead part 33, even if this invention is not restricted to this and it pulls it out from either, it is easy to be natural [this invention].
[0069]Although each of each above-mentioned embodiments showed the example applied to the acceleration sensor, this invention cannot be restricted to this and can also be used for a pressure sensor. That is, as it indicates drawing 18 that the pressure sensor is known well, it is formed in the surface of the glass substrate 40 when the lead part 42 pulled out outside from the fixed electrode 41 and there vapor-deposits a predetermined metal membrane.
[0070]The diaphragm 45 is formed in the position which counters said fixed electrode 41, and this diaphragm 45 becomes the silicon semiconductor substrate 44 which anode joining was carried out to the glass substrate 40, and was united with it with a movable electrode. The pressure chamber 46 is

constituted between this diaphragm 45 and fixed electrode 41, The diaphragm 45 changes according to the pressure introduced in the pressure chamber 46 via the pressure inlet 47 formed in the glass substrate 40 (it usually swells), and the distance between the diaphragm (movable electrode) 45 and the fixed electrode 41 changes. The capacity variation accompanying this change is outputted to an external circuit via the lead part 42. And the crevice 48 is formed and the portion which usually counters the lead part 42 among the planes of composition of the silicon semiconductor substrate 44 has become a noncontact state.

[0071]The short circuit electric conduction pattern 49 which projects in the side is formed, and it is made to locate the tip part 49a of the short circuit electric conduction pattern 49 in the joining section S with the glass substrate 40 of the silicon semiconductor substrate 44 by this invention here from the lead part 42 which counters said crevice 48. Since the diaphragm 45 will connect with the fixed electrode 41 too hastily at the time of anode joining and it will become same electric potential if it has starting composition, it can prevent being able to draw near mutually and contacting.

[0072]And the function as a sensor is demonstrated by sending predetermined high electric current, blowing out the portion of the short circuit electric conduction pattern 49, and insulating between two electrodes between two electrodes, like each of that embodiment that carried out the account of Gokami.

[0073]In the example of a graphic display, like a 3rd embodiment, since some short circuit electric conduction patterns 49 are made narrow, it is certainly blown out from the part concerned. Although a concrete graphic display is omitted, of course, the pressure-sensor side can also apply the same thing as each embodiment of the above-mentioned acceleration sensor.

[0074]

[Effect of the Invention]As mentioned above, in the capacity type semiconductor dynamic quantity sensor and manufacturing method concerning this invention, it can be made same electric potential by a chip unit, without using the special jig from the outside like before, in order to make a movable electrode and a fixed electrode into same electric potential at the time of anode joining. Therefore, the special device for carrying out same electric potential (short circuit) becomes unnecessary, and a manufacturing process is simplified. Although the device for blowing out a short circuit current carrying part is needed, since it is not necessary to make it contact simultaneously to all the chips unlike using same electric potential at the time of the conventional anode joining, a device can also be simplified.

[0075]And since it can respond only by forming a short circuit current carrying part in shape suitably also to a sensor of a different kind since a jig becomes unnecessary, it can communalize and mass production nature of an anode joining device improves. Since the jig is unnecessary, the miniaturization of sensor shape can be attained.

[0076]Since a fixed electrode and a movable electrode (semiconductor substrate) can be short-circuited for each sensor chip of every, it can be more certainly made same electric potential and dispersion in the characteristic becomes small.

[0077]When a short circuit current carrying part is formed according to the same construction material as a fixed electrode (claim 2), when manufacturing a fixed electrode, it can form simultaneously, and can carry out at a process with easy production of a short circuit current carrying part.

[0078]Compared with a fixed electrode, voltage or current cuts a short circuit current carrying part, Or when it constitutes from material which deteriorates easily or a part of (claim 3) and short circuit current carrying part make it narrower than the surrounding width (claim 4), The rise of the resistance by cutting or deterioration of a short circuit current carrying part can attain easily by applying high tension to the

external connection inter-electrode of the external connection electrode of a fixed electrode, and a movable electrode after the end of anode joining, or other means.

[0079]When a short circuit current carrying part etc. are covered with an insulator layer (claims 6 and 7), scattering of the fragment of a short circuit current carrying part by which it is generated in the case of cutting of a short circuit current carrying part performed after the end of anode joining, the outgas produced in the case of deterioration, etc., or generating can be suppressed.

[0080]Since it will become possible to be common in the process of separating into a sensor chip the process of disconnecting a short circuit current carrying part from a wafer by dicing if it carries out like claim 5 further again, a production man hour and its work can be performed as usual. In the semiconductor sensor similarly formed like claim 8, since the process of disconnecting a short circuit current carrying part after anode joining becomes unnecessary, it can manufacture easily and reliability also increases.

TECHNICAL FIELD

[Field of the Invention]This invention relates to a capacity type semiconductor dynamic quantity sensor and a manufacturing method.

PRIOR ART

[Description of the Prior Art]Drawing 1 and drawing 2 show an example of the conventional capacity type acceleration sensor. As shown in the figure, the glass substrate 2a and 2b are arranged to up-and-down both sides of the silicon semiconductor substrate 1. And both the boards 1 and 2a and 2b are joined by the anode joining method in the periphery S.

[0003]The silicon semiconductor substrate 1 is formed so that the cantilevered suspension of the weight part 4 may be carried out by etching processing via the beam part 5 to the frame-like buck 3. It is thinner than the buck 3 so that displacement of the weight part 4 may be attained, and specifically, elastic support of the displacement of it is made possible up and down in the center of an inner periphery of the buck 3 via the beam part 5 which has elasticity.

[0004]Up-and-down both sides of this weight part 4 serve as a movable electrode, make this movable electrode counter, and the upper part fixed electrode 7a is formed in the inner surface of the upper glass substrate 2a, The bottom fixed electrode 7b (a "fixed electrode" is only called hereafter in the part which does not need to distinguish the upper part fixed electrode 7a and the bottom fixed electrode 7b) is formed in the inner surface of lower glass substrate 2b.

[0005]And the electric capacity according to a gap occurs between a movable electrode and a fixed electrode. Therefore, when acceleration is added, the beam part 5 bends, in order that the weight part 4 may move, the above-mentioned gap changes, and the electric capacity generated between two electrodes also changes. And it asks for change of a gap, i.e., acceleration, by detecting change of the electric capacity.

[0006]The structure for taking out change of the electric capacity outside is as follows. First, since the silicon semiconductor substrate 1 has conductivity, the movable electrode side will be in switch-on to the buck 3 currently united with the weight part 4. Then, the conductive thin film 9a which formed the through hole 8a in the prescribed position of the fixed electrode 2a which is an insulator as shown in drawing 1, and was formed in the surface of the glass substrate 2a via the through hole 8a is made to flow. And it becomes connectable with an external circuit with the wire (not shown) by which bonding was carried out to the conductive thin film 9a.

[0007]Similarly, as shown in drawing 2, it pulls out succeeding the bottom fixed electrode 7b, and the lead part 10 of business is formed. On the other hand, the reverse truncated pyramid-like block part 11 is formed in the prescribed position in the buck 3 of the silicon semiconductor substrate 1 which counters the tip part of the lead part 10. And this block part 6 is contacted to the above-mentioned lead part 10 on that bottom while it separates mutually electrically with the buck 3. The through hole 8b which formed the upper surface of the block part 11 in the glass substrate 2a is made to contact furthermore. Thereby, the bottom fixed electrode 7b flows in the conductive thin film 9b formed in the surface of the glass substrate 2a via the lead part 10, the block part 11, and the through hole 8b. And it becomes connectable with an external circuit with the wire (not shown) by which bonding was carried out to the conductive thin film 9b.

[0008]Although a graphic display abbreviation is carried out, the upper part fixed electrode 7a formed in the upper glass substrate 2a also flows via the through hole formed in the glass substrate 2a in each above-mentioned conductive thin films 9a and 9b and the conductor thin film formed in the insulating state, and is connected to an external circuit.

[0009]By the way, in manufacturing this acceleration sensor. After forming the state where the buck 3,

the weight part 4, and the block part 11 are not probably separated thoroughly into the silicon semiconductor substrate 1 by electrochemical etching etc., glass substrate 2b is joined to the silicon semiconductor substrate 1 by an anode joining method. Then, by etching, the beam part 5 is formed, the weight part 4 is separated, and displacement is made possible. After separating the block part 11 from the buck 3 furthermore, an acceleration sensor is produced by joining the silicon semiconductor substrate 1 and the glass substrate 2a by an anode joining method.

[0010]Under the present circumstances, after the anode joining of the silicon semiconductor substrate 1 and the glass substrate 2a enables displacement of the weight part 4, it must be joined, and the weight part 4 whose displacement was attained approaches with the fixed electrode 7a or 7b formed in one glass substrate 2a or 2b of electrostatic attraction in the case of junction. And there is a possibility that one fixed electrode may contact the weight part 4 with electrostatic attraction, or one [the weight part 4 and] fixed electrode may alloy and weld with heat. When the starting situation was produced, even if acceleration was added, it would not be displaced, and the electric capacity between the weight part 4 and a fixed electrode did not change by this, but the weight part 4 had a fault of it becoming impossible to detect acceleration.

[0011]In order to solve the starting problem, it is similar with the above-mentioned acceleration sensor, and there is an invention indicated by JP,4-6888,B as conventional technology of the pressure sensor which is the same target technical field [this invention]. This invention forms the portion (crevice) 13 to which a large number became depressed on the surface (opposed face with glass substrate 2') of silicon wafer 1' on a lattice-like intersection, as shown in drawing 3 - drawing 5. The fixed electrode 14 is formed in the surface of glass substrate 2' which counters the crevice 13. And where silicon wafer 1' and glass substrate 2' are joined, as shown in drawing 5, the crevice 13 will constitute the pressure chamber in a final semiconductor pressure sensor.

[0012]Subsequently, while connecting silicon wafer 1' to the anode of the power supply for anode joining, glass substrate 2' is connected to the negative electrode of the power supply for anode joining, and predetermined voltage is impressed among two poles in the state. Thereby, current is sent between silicon wafer 1' and glass substrate 2', and uniting (anode joining) of the contacting parts is carried out. Thus, after carrying out anode joining, many sensor chips are separated and started by cutting in length and a transverse direction.

[0013]Here, the through hole 15a through which it flows in the fixed electrode 14 before joining, as expanded and shown in drawing 4, and the through hole 15b through which it flows in silicon wafer 1' are formed in the prescribed position of glass substrate 2'.

[0014]And when carrying out anode joining, as first shown in drawing 5, the pin 17 is contacted to each through hole 15a connected to each fixed electrode 14, respectively. Each of this pin 17 is connected to the anode of the power supply for anode joining. If anode joining is carried out in this state, the through hole 15a in contact with each pin 17 and the fixed electrode 14 will become the potential of the level mostly with the predetermined positive potential impressed to the silicon wafer 1' side at the time of anode joining. Therefore, since there is almost no potential difference of the fixed electrode 14 and silicon wafer 1' (bottom of the crevice 13) and it opposes mutually, contacting and welding is lost.

EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, in the capacity type semiconductor dynamic quantity sensor and manufacturing method concerning this invention, it can be made same electric potential by a chip unit, without using the special jig from the outside like before, in order to make a movable electrode and a fixed electrode into same electric potential at the time of anode joining. Therefore, the special device for carrying out same electric potential (short circuit) becomes unnecessary, and a manufacturing process is simplified. Although the device for blowing out a short circuit current carrying part is needed, since it is not necessary to make it contact simultaneously to all the chips unlike using same electric potential at the time of the conventional anode joining, a device can also be simplified.
[0075]And since it can respond only by forming a short circuit current carrying part in shape suitably also to a sensor of a different kind since a jig becomes unnecessary, it can communalize and mass production nature of an anode joining device improves. Since the jig is unnecessary, the miniaturization of sensor shape can be attained.
[0076]Since a fixed electrode and a movable electrode (semiconductor substrate) can be short-circuited for each sensor chip of every, it can be more certainly made same electric potential and dispersion in the characteristic becomes small.
[0077]When a short circuit current carrying part is formed according to the same construction material as a fixed electrode (claim 2), when manufacturing a fixed electrode, it can form simultaneously, and can carry out at a process with easy production of a short circuit current carrying part.
[0078]Compared with a fixed electrode, voltage or current cuts a short circuit current carrying part, Or when it constitutes from material which deteriorates easily or a part of (claim 3) and short circuit current carrying part make it narrower than the surrounding width (claim 4), The rise of the resistance by cutting or deterioration of a short circuit current carrying part can attain easily by applying high tension to the external connection inter-electrode of the external connection electrode of a fixed electrode, and a movable electrode after the end of anode joining, or other means.
[0079]When a short circuit current carrying part etc. are covered with an insulator layer (claims 6 and 7), scattering of the fragment of a short circuit current carrying part by which it is generated in the case of cutting of a short circuit current carrying part performed after the end of anode joining, the outgas produced in the case of deterioration, etc., or generating can be suppressed.
[0080]Since it will become possible to be common in the process of separating into a sensor chip the process of disconnecting a short circuit current carrying part from a wafer by dicing if it carries out like claim 5 further again, a production man hour and its work can be performed as usual. In the semiconductor sensor similarly formed like claim 8, since the process of disconnecting a short circuit current carrying part after anode joining becomes unnecessary, it can manufacture easily and reliability also increases.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional method, although a fixed electrode and a weight part can be prevented from welding at the time of anode joining, the problem newly shown below is produced. That is, the device for the wiring for connecting with a power supply, etc. being needed, and carrying out anode joining of jigs, such as a pin for using same electric potential, and the pin of those from the exterior, is enlarged. And in order to have to perform anode joining in the state where it was contacted certainly in the through hole which corresponds each pin of the jig, highly precise assembling precision is required and it becomes complicated [manufacture of the device to apply]. If it is complicated to operate the device for carrying out anode joining and contact of a pin will not be enough, holding the state where it was made to contact with a jig such, it will not be able to maintain at same electric potential, but the above-mentioned problem will be generated, and generating of inferior goods will be caused.

[0016]In order to contact each through hole and the pin 17 certainly, While making possible mutually rise and fall movement of each pin 17 independently, the mechanism pushed against the through hole side by a predetermined pressure with a spring etc. as the gazette was also indicated becomes indispensable, It will become what has the complicated and expensive composition of a jig conjointly that it is also necessary to short-circuit each pin itself mutually.

[0017]In order to contact a pin to all the fixed electrodes, it necessary, many pins are dramatically needed, and the structure of a jig complicates the number of pins more. [which are manufactured from at least one wafer] [a chip number and] [same number] Although a jig including a pin must also be miniaturized with the miniaturization of a sensor, there is a limit in it. As a result, the limit of a miniaturization of a sensor arises from the request by the side of a device, and it becomes a neck when attaining the further miniaturization of sensor shape. To the sensor of a different kind, arrangement of the above-mentioned pin, etc. must be changed according to the layout on a wafer, and flexibility is missing.

[0018]Since it is connected [silicon wafer 1' and the fixed electrode 14] to the positive pole terminal of the same power supply, although same electric potential is served as mostly, they are not necessarily short-circuited directly and do not necessarily become same electric potential thoroughly. And if there is a part where potential difference becomes large selectively, the chip in the portion will serve as inferior goods for the same reason as the conventional problem.

[0019]The place which this invention was made in view of the above-mentioned background, and is made into the purpose, Solve the above-mentioned problem and the special jig for making the fixed electrode and semiconductor substrate (movable electrode) side into same electric potential is made unnecessary, It is in providing the capacity type semiconductor dynamic quantity sensor and manufacturing method which can respond to a sensor of a different kind, can be adapted also for the miniaturization of a sensor chip, can make it same electric potential by each tip part certainly, and can manufacture a sensor with small characteristic dispersion.

MEANS

[Means for Solving the Problem]In order to attain the above-mentioned purpose, in a manufacturing method of a capacity type semiconductor dynamic quantity sensor concerning this invention. While contacting said fixed board and a semiconductor substrate which has a movable electrode so that a fixed electrode may be formed in the surface of an insulating fixed board and said fixed electrode may be countered, It was made to perform the two following steps on the assumption that a manufacturing method of a capacity type semiconductor dynamic quantity sensor including a process which is made to impress and carry out anode joining of the anode joining voltage, and is unified among both substrates (claim 1).

[0021]Before contacting [predetermined timing before the 1st carries out step anode joining] said both substrates, while flowing in said fixed electrode, the part provides a short circuit current carrying part located in a junction area where said both boards contact in the surface of said fixed board. This short circuit current carrying part can also be simultaneously formed, when carrying out pattern formation of the same member as a fixed electrode, i.e., the fixed electrode, (claim 2). In this case, in an embodiment, it is equivalent to the short circuit electric conduction pattern 23, 23', and 23 ". It may constitute from a separate member (claim 3). According to an embodiment equivalent to this, it is equivalent to the short circuit conductor 27.

[0022]It is made for said short circuit current carrying part to raise cutting or resistance to predetermined timing after the 2nd carries out step anode joining. Usually, although a semiconductor dynamic quantity sensor to apply forms many tip parts on a wafer, it cuts in length and a transverse direction eventually (dicing) and it separates into a sensor chip in every piece, this 2nd step may be performed in a stage of a wafer before starting cutting, or may be performed for every chip after cutting.

[0023]In this invention, when carrying out anode joining, a fixed electrode is connected with a semiconductor substrate (movable electrode) by short circuit current carrying part, and a movable electrode and a fixed electrode serve as same electric potential. Therefore, when carrying out anode joining, two electrodes do not contact with electrostatic attraction and do not alloy, either. And, for example after an end of junction, this short circuit current carrying part sends current through a short circuit current carrying part by applying high tension to the external connection inter-electrode of an external connection electrode of a fixed electrode, and a movable electrode etc., this short circuit current carrying part is blown out by generation of heat then produced, or is deteriorated and raises resistance. Thereby, a movable electrode and a fixed electrode are made to separate electrically. Therefore, detection of dynamic quantity, such as acceleration and a pressure, can be obtained like the conventional various sensor. When deteriorating especially a short circuit current carrying part, even if it heats using a heating method, same operation effect is obtained.

[0024]When said short circuit current carrying part makes said semiconductor substrate contact in portions other than a chip formation region on a wafer and carries out dicing of said wafer as another solving means for attaining the above-mentioned purpose, it may be made to disconnect said short circuit current carrying part (claim 4).

[0025]If it has starting composition, dicing treatment separated from a wafer for every sensor chip and cut treating of a short circuit current carrying part can be made to make it serve a double purpose. Therefore, processing at a manufacturing process number or each process can also be performed as usual only by changing a mask pattern used at the time of patterning of a fixed electrode etc., and etching to a

semiconductor substrate, and it becomes unnecessary [change of a manufacturing facility].
[0026]And it is forming thinly said a part of short circuit current carrying part preferably (claim 5). Since current and voltage will concentrate on the portion which became thin when current is sent through a short circuit current carrying part for cutting if it has starting composition, a rise of resistance by cutting or deterioration of a short circuit current carrying part can attain easily.
[0027]said short circuit current carrying part -- an insulator layer -- a wrap -- making it like **** -- (claim 6), said short circuit current carrying part, and said fixed electrode -- an insulator layer -- a wrap -- like -- carrying out (claim 7) -- it is more desirable. When it has starting composition, after an end of junction by for example, means, such as applying high tension to the external connection inter-electrode of an external connection electrode of a fixed electrode, and a movable electrode. When cutting or deteriorating this short circuit current carrying part and raising resistance, scattering and generating of a fragment in which a short circuit current carrying part was disconnected, or outgas produced in the case of deterioration can be suppressed. And since the fixed electrode side also exists [an insulator layer] in inter-electrode with an insulator layer in addition to a wrap and the above-mentioned operation, even if it is not able to ensure a short circuit, there will be no possibility that a movable electrode and a fixed electrode which counter may carry out direct contact, and an insulation of two electrodes will be taken certainly.
[0028]In a capacity type semiconductor dynamic quantity sensor concerning this invention as an another-solution conclusive factor stage for on the other hand attaining the above-mentioned purpose. In a capacity type semiconductor dynamic quantity sensor which anode joining of a fixed board in which a fixed electrode was provided, and the semiconductor substrate was carried out, and was unified, It flowed at the time of high voltage impression for anode joining, and a short circuit electric conduction pattern which has a gap which is un-flowing at the time of the usual dynamic quantity measurement is provided, and it was made for said fixed electrode and a semiconductor substrate to flow via said short circuit electric conduction pattern at the time of anode joining (claim 8).
[0029]In a sensor of starting structure, at the time of anode joining, since high tension is impressed, as it flows through the surface of a fixed board, an electron flies and current flows between gaps. Therefore, since two electrodes become same electric potential mostly, contacting of them with electrostatic attraction is lost. On the other hand, in the time of the usual sensor use after anode joining, voltage generated between gaps is small and current does not flow. Therefore, since it will be in an insulating state between two electrodes, a signal based on electric capacity generated between two electrodes can be outputted outside. That is, in this composition, after anode joining, a short circuit current carrying part is disconnected, or insulation-ized processing in which it is made to deteriorate becomes unnecessary, and it can respond according to the same manufacturing process (what is necessary is just to change a mask pattern at the time of generating a fixed electrode) as usual.
[0030]
[Embodiment of the Invention]Drawing 6 and drawing 7 show a 1st embodiment of this invention. Drawing 6 shows the glass substrate 20 corresponding to one sensor chip portion, and in a actual manufacturing process, as shown in drawing 3, the field corresponding to the above-mentioned glass substrate 20 is assigned by each part of the surface of a big glass substrate. And at the usual process, the fixed electrode 21 and the lead part 22 which consist of specified pattern shape by vacuum evaporation or weld slag are first formed in the junction side surface of this glass substrate 20 simultaneously (refer to drawing 6).

[0031]As it is pulled out from the fixed electrode 21 simultaneously with it in the case of the process of manufacturing the above-mentioned fixed electrode 21 grade, he is trying to form the short circuit electric conduction pattern 23 by this invention here. And he is trying to locate the tip part 23a of this short circuit electric conduction pattern 23 in the buck by the side of the silicon semiconductor substrate of a graphic display abbreviation, and the junction area (field of the outside of a dashed dotted line) 24 of the glass substrate 20.
[0032]Thus, only by changing vacuum evaporation / pattern shape at the time of carrying out weld slag, each other manufacturing processes can perform predetermined metal on the surface of the glass substrate 20 like the conventional thing. That is, to a silicon semiconductor substrate (wafer), a buck, a weight part, a beam part, etc. are formed by etching. And as the column of the Prior art also explained, the relative position is doubled and the silicon semiconductor substrate and the glass substrate 20 to apply are contacted.
[0033]Then, the tip part 23a of the short circuit electric conduction pattern 23 contacts a silicon semiconductor substrate. This short-circuits electrically the fixed electrode 21 and a movable electrode (formed in a weight part) via the short circuit electric conduction pattern 23 and a silicon semiconductor substrate. Anode joining voltage is impressed between the glass substrate 20 and a silicon semiconductor substrate in this state, and anode joining of both the boards is carried out in the junction area 24.
[0034]Since a fixed electrode and a movable electrode are short-circuited and it has become same electric potential at this time, it becomes difficult to generate the potential difference between both. Contact by inter-electrode electrostatic attraction and welding by alloying of the electrodes accompanying discharge are lost by this at the time of anode joining.
[0035]And by giving predetermined down stream processing of anode joining and others as mentioned above, as shown in drawing 7, the glass substrate 20 is joined to up-and-down both sides of the silicon semiconductor substrate 25 provided with the weight part (movable electrode), and it unites with them. The three through holes 26a-26c penetrated up and down are formed in the prescribed position of the upper glass substrate 20. It has flowed through each through holes 26a-26c at each in the conductor thin films 27a-27c which dissociated mutually and were formed on the surface of the glass substrate 20.
[0036]And it flows through the through holes 26a and 26b, respectively in each fixed electrode formed in the up-and-down glass substrate, and they flow through the through hole 26c in the silicon semiconductor substrate 25.
[0037]Then, after carrying out anode joining, predetermined high tension is impressed, respectively among the conductor thin films 27a and 27c and among the conductor thin films 27b and 27c. Then, in the state immediately after carrying out anode joining, since a corresponding fixed electrode and movable electrode have flowed via the short circuit electric conduction pattern 23, current flows into the short circuit electric conduction pattern 23. And if a current value is carried out more than [a certain] fixed, the short circuit electric conduction pattern 23 will exhibit the same function as a kind of fuse, and will be blown out. Since the width of the short circuit electric conduction pattern 23 is dramatically small compared with the width by the side of the fixed electrode 21 and a silicon semiconductor substrate at this time, the resistance of that short circuit electric conduction pattern 23 is high compared with other portions, and the part concerned is blown out certainly.
[0038]Since inter-electrode is insulated eventually by this, it can function as a usual sensor after that. That is, if bonding of the wire is carried out to the three conductor thin films 27a-27c, the electric capacity between one fixed electrode and a movable electrode will be detected among the conductor thin

films 27a and 27c, and the electric capacity between the fixed electrode of another side and a movable electrode will be detected among the conductor thin films 27b and 27c.

[0039]Blowout processing of the above-mentioned short circuit electric conduction pattern 23 may be performed on a wafer, or it may carry out, after cutting and separating into each chip shape. And since it is not necessary to send the current for blowing out simultaneously to all the tip parts which exist on a wafer also when carrying out on a wafer, the structure of the device for sending the current for [starting] blowing out can be simplified. That is, when the number of pins can also be lessened and it is made to energize for every tip part of a predetermined number, it can respond also to the sensor chip of a different kind, and will be rich in flexibility.

[0040]Drawing 8 shows the important section of a 2nd embodiment of this invention, and is a figure corresponding to drawing 6. At this embodiment, although it is the same as that of a 1st embodiment fundamentally, it differs in trying that short circuit electric conduction pattern 23' is pulled out from the lead part 22 of the fixed electrode 21.

[0041]It can manufacture by the same process as a 1st embodiment except changing the applied pattern shape. And at the time of anode joining, since the fixed electrode 21 is connected with the silicon semiconductor substrate (movable electrode) too hastily via the lead part 22 and short circuit electric conduction pattern 23', it is lost that between two electrodes contacts and unites. By impressing voltage between the conductor thin films connected to two electrodes, current flows in order of a lead part 22 -> short circuit electric conduction pattern 23'-> silicon semiconductor substrate (or the reverse), and after anode joining is made to blow out in a short circuit electric conduction pattern 23' portion, and aims at the insulation between two electrodes.

[0042]In order to make it blow out in the portion of short circuit electric conduction pattern 23' certainly, it is making width W2 of short circuit electric conduction pattern 23' smaller than the width W1 of the lead part 22 into which the current for making it blow out flows. Since the current for [above-mentioned] making it blow out does not flow into the lead part 22 by the side of the fixed electrode 21 rather than the connection section of the lead part 22 and short circuit electric conduction pattern 23', the width serves as unquestioned.

[0043]Drawing 9 shows the important section of a 3rd embodiment of this invention. This embodiment is the same as that of a 2nd embodiment, and he is trying to pull out short circuit electric conduction pattern 23" from the lead part 22 of the fixed electrode 21 fundamentally. As for it being different from a 2nd embodiment here, 23" of omitted portions of the short circuit electric conduction pattern 23" narrow width of b compared with other portions.

[0044]When the current for blowout is sent through short circuit electric conduction pattern 23" by having starting composition, in 23" of the omitted portion, an electric charge concentrates on b, and it blows out in the portion certainly (open circuit). If it puts in another way, the place of an open circuit can be set as arbitrary places. Since other processes are the same as that of each above-mentioned embodiment, they attach identical codes and omit the detailed explanation.

[0045]Drawing 10 shows a 4th embodiment of this invention. Although the short circuit electric conduction pattern was simultaneously formed with the identical material on the occasion of the pattern formation of a fixed electrode, he is trying to form by a separate member with a fixed electrode at this embodiment in each above-mentioned embodiment.

[0046]That is, the fixed electrode 21 and the lead part 22 are first formed using Ti/Pt so that it may illustrate. This process is the same as that of the conventional thing. Subsequently, the band-like short

circuit conductor 27 is formed using aluminum which deteriorates at low temperature (oxidation) rather than the metal (Ti/Pt) in which the fixed electrode 21 grade was formed. And one end of this short circuit conductor 27 is contacted to the lead part 22, and the other end is located in the junction area 24.
[0047]In this state, the silicon semiconductor substrate formed separately is contacted and anode joining is carried out. Then, since silicon semiconductor substrate ****** connects the fixed electrode 21 with a movable electrode too hastily via the lead part 22 and the short circuit conductor 27 and it becomes same electric potential, two electrodes are attracted and it does not contact.
[0048]And it performs insulating between the fixed electrode which counters after anode joining, and a movable electrode by heating the short circuit conductor 30 and deteriorating it (oxidation). That is, by oxidizing aluminum which constitutes the short circuit conductor 30, and making it an aluminum oxide, resistance is raised and it is made an insulating material. Thereby, electrically, between two electrodes, it dissociates and the function as a usual sensor is exhibited.
[0049]And as the above-mentioned method of heating, like blowout of the short circuit electric conduction pattern in the case of each above-mentioned embodiment, High tension can be impressed between two electrodes, high electric current can be sent through the short circuit conductor 30, and various methods, such as using generation of heat accompanying this energization, installing under a high temperature atmosphere, or laying on the heating method of a hot plate etc., can be taken. And in any case, since the fixed electrode 21 is thermally stable at Ti/Pt (comparing with aluminum), short circuit conductor 30 portion oxidizes first, and it is insulation-ized.
[0050]Since what is necessary is just to arrange the sensor chip itself in predetermined heating apparatus in this embodiment since the short circuit conductor 30 should just be heated and it is not necessary to energize to the short circuit conductor 30, Since the size and shape of a sensor chip are not asked while being able to process simultaneously to many sensor chips, an insulation process can be performed easily.
[0051]Drawing 11 shows a 5th embodiment of this invention. According to this embodiment, it was different from each above-mentioned embodiment, a distance narrow in the intermediate part of the short circuit electric conduction pattern 28 pulled out from the lead part 22 was separated, and the fixed electrode 21 and junction area 24 side is divided.
[0052]That is, as expanded and shown in drawing 12, the both ends 31a and 31b of the short circuit electric conduction pattern 31 are connected to the lead part 22 and the junction area 24, respectively. And the intermediate part 31c of the short circuit electric conduction pattern 31 is formed in the shape of [which set the slit very much and entered by turns] a ctenidium. And like a 1st and 2nd embodiment, the pattern to apply can be simultaneously formed, when forming fixed electrode 21 grade. That is, the process which it became independent of for forming the short circuit electric conduction pattern 31 becomes unnecessary.
[0053]Subsequently, the same manufacturing process as usual is performed, and anode joining is carried out. Then, excessive voltage is added to a fixed electrode and movable electrode inter-electrode at the time of this anode joining, and the big potential difference also between the ctenidium-like portions which the intermediate part 31c of the short circuit electric conduction pattern 31 approaches occurs. Then, current flows through the intermediate part 31c of the short circuit electric conduction pattern 31 which the electron was transmitted and left the surface of the glass substrate 20 physically. The fixed electrode 21 and a movable electrode will be in a short condition, inter-electrode voltage is reduced and inter-electrode contact and welding stop thereby, producing it.

[0054]After that usual processing is performed and a sensor chip is manufactured. Although processing for blowing out or deteriorating a short circuit electric conduction pattern and a short circuit conductor was performed by each above-mentioned embodiment at this time, it is not necessary to perform starting special processing in this embodiment. That is, since the inter-electrode voltage generated when using it as a usual sensor since the intermediate part 31c of the short circuit electric conduction pattern 31 is deserted and separated is small, current does not flow through the intermediate part 31c concerned. Therefore, an insulating state is maintained between two electrodes and a sensor functions correctly.
[0055]therefore, the pattern shape of the mask at the time of forming a fixed electrode in this embodiment -- only changing (the short circuiting conductor pattern 31 is formed simultaneously) -- since other manufacturing processes can be performed as usual, the effect that it can be used as it is also does the conventional equipment so.
[0056]In the above-mentioned embodiment, although it dissociated in the intermediate part of the short circuit conductor pattern 31, this invention may not be restricted to this and the connection side edge part [with the lead part 22] 31a or end 31b side by the side of the junction area 24 may separate it. It may be made to also make the shape of the leaver section approach the portion which counters by one point, as it does not restrict in the shape of [above-mentioned] a ctenidium, for example, is shown in drawing 13. Thereby, it becomes easy to concentrate an electric charge on 31d of vertices portion of the triangle, and current can be certainly sent at the time of anode joining. Further again, as shown in each figure, even if a leaver section makes it linear shape rather than gives unevenness, it is easy to be natural [a leaver section].
[0057]Although the thing of the gap to describe above also pulled out the short circuiting conductor pattern 31 from the lead part 22 further again, it is easy to be natural even if it makes it pull out directly from the fixed electrode 21 side like a 1st embodiment.
[0058]Drawing 14 shows a 6th embodiment of this invention. This embodiment forms the protective film 34 which consists of insulating resin like polyimide so that the short circuit electric conduction pattern 23" may be covered on the basis of a 3rd embodiment that made narrow the omitted portion of short circuit electric conduction pattern 23". And where the protective film 30 is formed, anode joining is carried out, and when sending and blowing out current to short circuit electric conduction pattern 23" at an after that predetermined process, scattering of the fragment of the blowout and a short circuit electric conduction pattern when it cuts can be prevented. Therefore, it bars that a foreign matter (fragment of a short circuit electric conduction pattern) mixes in inter-electrode, and a sensor becomes poor.
[0059]And although the starting protective film 34 should just cover the portion blown out at least, he may be trying to cover it on the fixed electrode 21, as it is conversely indicated in drawing 15 as it. And it is good to use the fixed electrode 21 for a wrap case for a SiO_2 thin film etc., since the gap with a movable electrode is short.
[0060]If it has starting composition, the effect of preventing the inter-electrode contact at the time of junction by installation of a short circuit electric conduction pattern and welding can be made still higher (since the SiO_2 thin film which consists of insulators will exist between SiO2 two electrodes even if two electrodes approach). It bars that a sensor becomes prevent scattering of a fragment when it cuts further, and a foreign matter mixes in inter-electrode, and not to unite and poor.
[0061]It is applicable to what [all] blows out a short circuit electric conduction pattern (short circuit

conductor) to provide the starting protective film.

[0062]Drawing 16 shows a 6th embodiment of this invention. According to this embodiment, a short circuiting conductor pattern is cut after anode joining, and it differs from each embodiment which the process of separating a fixed electrode and a movable electrode described above. That is, he uses the rectangular area surrounding [with a dashed dotted line] the chip formation region 35 on the glass substrate 20 first, and is trying to form the predetermined free space 36 between the adjacent chip formation regions 35. This free space 36 is a field used as a garbage, when the glass substrate 20 is eventually cut in length and a transverse direction and it dissociates for every sensor chip. However, the portion of this free space 36 contacts a silicon semiconductor substrate, and anode joining is carried out.

[0063]And in this embodiment, on the glass substrate 20, by carrying out pattern formation of the predetermined metal membrane, as it pulls out from each of the fixed electrode 21 and the lead part 22, the short circuit electric conduction pattern 38 is formed. And the tip part 38a of each short circuit electric conduction pattern 38 is carrying out extended formation even in the above-mentioned free space 36. The starting conditions are not indispensable although it has connected also with the fixed electrode of the chip formation region 35 which adjoins under figure Nakagami in this example.

[0064]The silicon semiconductor substrate (silicon wafer) side is etched, and he faces forming a weight part, a beam part, a buck, etc., and is trying for the above-mentioned short circuit electric conduction pattern 38 and a silicon semiconductor substrate to become non-contact in the chip formation region 35. Specifically, the portion 35a corresponding to the short circuit electric conduction pattern 38 is removed to a concave. The short circuit electric conduction pattern 38 contacts the silicon semiconductor substrate which exists in the free space 36, a fixed electrode and a movable electrode flow through it, and he is trying to become same electric potential by this.

[0065]Therefore, since two electrodes become same electric potential when carrying out anode joining, it does not contact mutually and does not weld. This point is the same as that of each above-mentioned embodiment. And after passing through the usual various processing, the cutting process separated for every sensor chip is performed. Namely, a substrate is cut for every prescribed interval in all directions. The dashed dotted line top specifically shown in drawing 16 is cut. Thereby, one sensor chip as shown in drawing 17 is formed.

[0066]And in the state where it separated into the chip so that clearly from drawing 17 since the silicon semiconductor substrate and the short circuit electric conduction pattern 38 were formed in the noncontact state in the silicon formation area. The short circuit electric conduction pattern 38 will not contact a silicon semiconductor substrate (joined to the glass substrate 20 in the field shown by hatching), but will be in an insulating state between a fixed electrode and a movable electrode. Therefore, it functions as a usual sensor.

[0067]According to this embodiment, since the process for separating between two electrodes was used also [cut treating / which is performed from the former / of a wafer], as a manufacturing process, the conventional thing which has other fundamental composition can be used as it is only by changing pattern shape compared with the conventional thing.

[0068]At the above-mentioned embodiment, although the short circuit electric conduction pattern 38 was pulled out from both the fixed electrode 21 and the lead part 33, even if this invention is not restricted to this and it pulls it out from either, it is easy to be natural [this invention].

[0069]Although each of each above-mentioned embodiments showed the example applied to the acceleration sensor, this invention cannot be restricted to this and can also be used for a pressure sensor.

That is, as it indicates drawing 18 that the pressure sensor is known well, it is formed in the surface of the glass substrate 40 when the lead part 42 pulled out outside from the fixed electrode 41 and there vapor-deposits a predetermined metal membrane.

[0070]The diaphragm 45 is formed in the position which counters said fixed electrode 41, and this diaphragm 45 becomes the silicon semiconductor substrate 44 which anode joining was carried out to the glass substrate 40, and was united with it with a movable electrode. The pressure chamber 46 is constituted between this diaphragm 45 and fixed electrode 41, The diaphragm 45 changes according to the pressure introduced in the pressure chamber 46 via the pressure inlet 47 formed in the glass substrate 40 (it usually swells), and the distance between the diaphragm (movable electrode) 45 and the fixed electrode 41 changes. The capacity variation accompanying this change is outputted to an external circuit via the lead part 42. And the crevice 48 is formed and the portion which usually counters the lead part 42 among the planes of composition of the silicon semiconductor substrate 44 has become a noncontact state.

[0071]The short circuit electric conduction pattern 49 which projects in the side is formed, and it is made to locate the tip part 49a of the short circuit electric conduction pattern 49 in the joining section S with the glass substrate 40 of the silicon semiconductor substrate 44 by this invention here from the lead part 42 which counters said crevice 48. Since the diaphragm 45 will connect with the fixed electrode 41 too hastily at the time of anode joining and it will become same electric potential if it has starting composition, it can prevent being able to draw near mutually and contacting.

[0072]And the function as a sensor is demonstrated by sending predetermined high electric current, blowing out the portion of the short circuit electric conduction pattern 49, and insulating between two electrodes between two electrodes, like each of that embodiment that carried out the account of Gokami.

[0073]In the example of a graphic display, like a 3rd embodiment, since some short circuit electric conduction patterns 49 are made narrow, it is certainly blown out from the part concerned. Although a concrete graphic display is omitted, of course, the pressure-sensor side can also apply the same thing as each embodiment of the above-mentioned acceleration sensor.

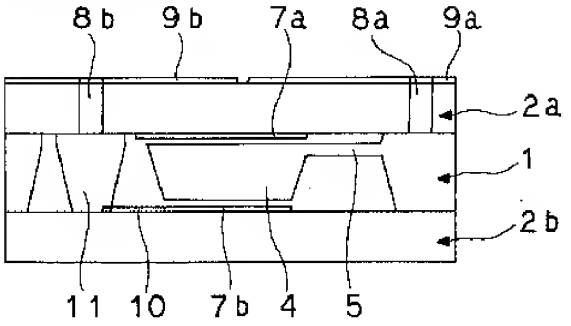
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a sectional view showing the acceleration sensor of a conventional example.
[Drawing 2]It is a perspective view showing the bottom glass substrate of the acceleration sensor of a conventional example.
[Drawing 3]It is a figure explaining the manufacturing method of the conventional pressure sensor.
[Drawing 4]It is a figure explaining the manufacturing method of the conventional pressure sensor.
[Drawing 5]It is a figure explaining the manufacturing method of the conventional pressure sensor.
[Drawing 6]It is a figure explaining a 1st embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor.
[Drawing 7]It is a perspective view showing the appearance of the sensor manufactured by carrying out a 1st embodiment.
[Drawing 8]It is a figure explaining a 2nd embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor.
[Drawing 9](A) is a figure explaining a 3rd embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor. (B) is the B section enlarged drawing of drawing 9 (A).
[Drawing 10](A) is a figure explaining a 4th embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor. (B) is the B section enlarged drawing of drawing 10 (A).
[Drawing 11]It is a figure explaining a 5th embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor.
[Drawing 12]It is the B section enlarged drawing of drawing 11.
[Drawing 13]In the modification of a 5th embodiment, it is a figure corresponding to drawing 12.
[Drawing 14](A) is a figure explaining a 6th embodiment of this invention, and is a perspective view showing the bottom glass substrate of an acceleration sensor. (B) is the B section enlarged drawing of drawing 14 (A).
[Drawing 15]It is a figure showing the modification of a 6th embodiment, and is a figure corresponding to drawing 14 (A).
[Drawing 16]It is a figure explaining a 7th embodiment of this invention.
[Drawing 17]It is a figure explaining a 7th embodiment of this invention, and is a top view showing the bottom glass substrate of the acceleration sensor after cutting.
[Drawing 18]It is a figure explaining the embodiment which applied this invention to the pressure sensor.
[Description of Notations]
20 Glass substrate
21 Fixed electrode
22 Lead part
23, 23', 23" short circuit electric conduction pattern (short circuit current carrying part)
24 The junction area of a silicon semiconductor substrate and a glass substrate

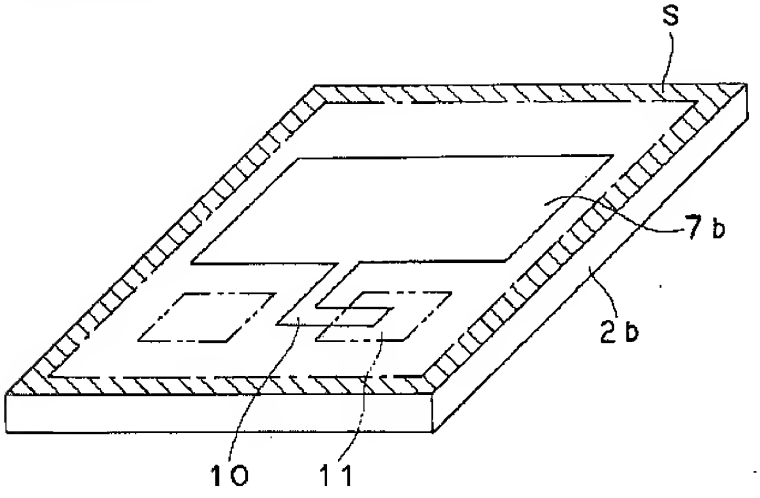
27 Short circuit conductor (short circuit current carrying part)

DRAWINGS

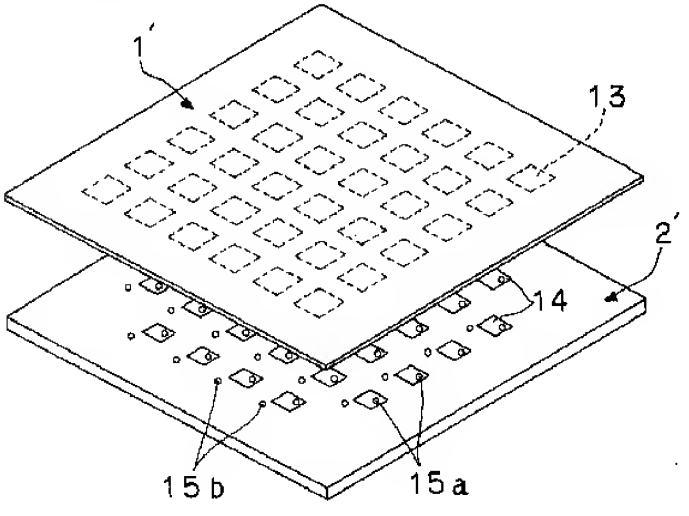
[Drawing 1]



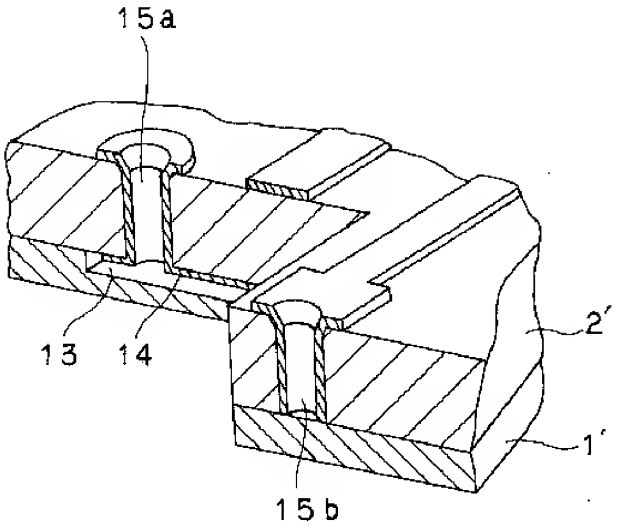
[Drawing 2]



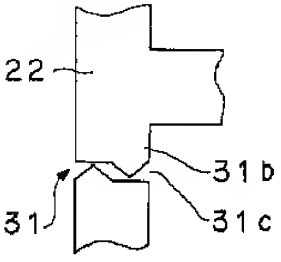
[Drawing 3]



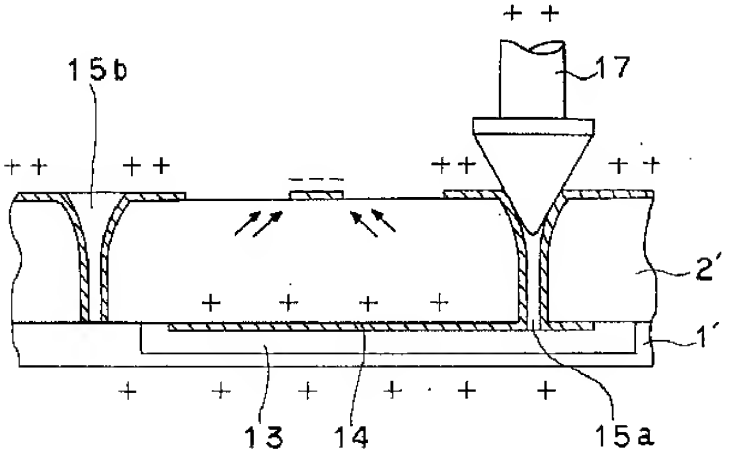
[Drawing 4]



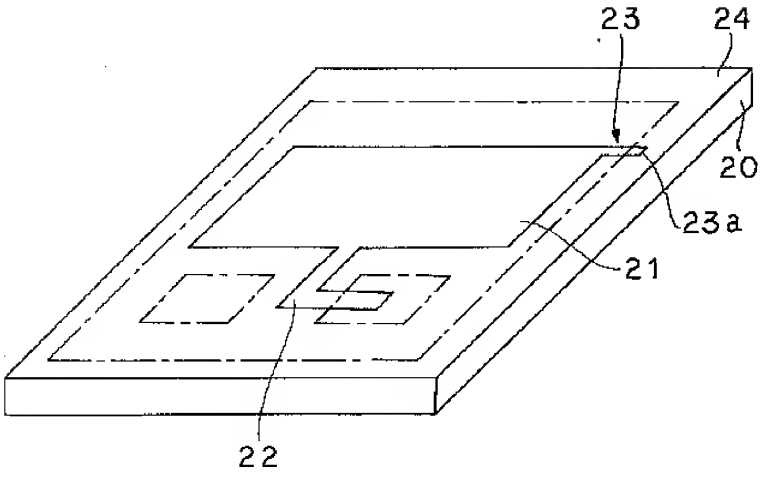
[Drawing 13]



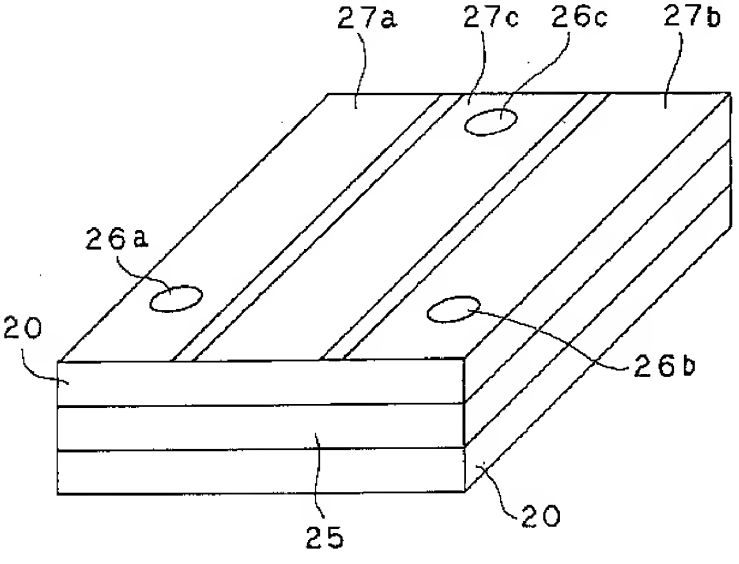
[Drawing 5]



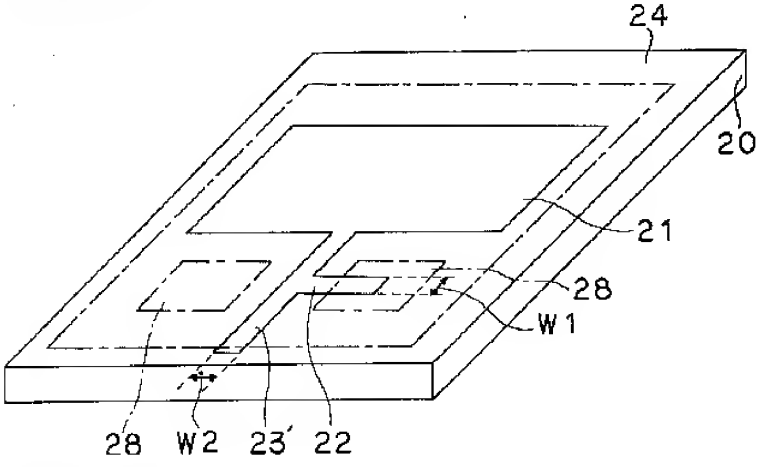
[Drawing 6]



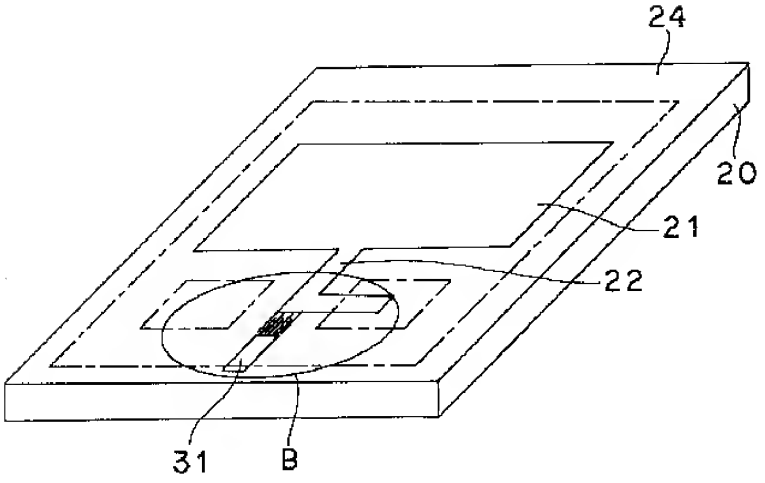
[Drawing 7]



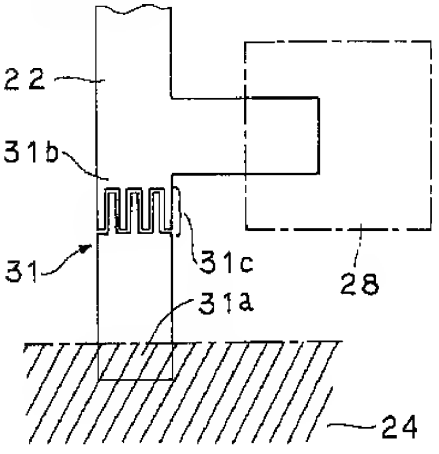
[Drawing 8]



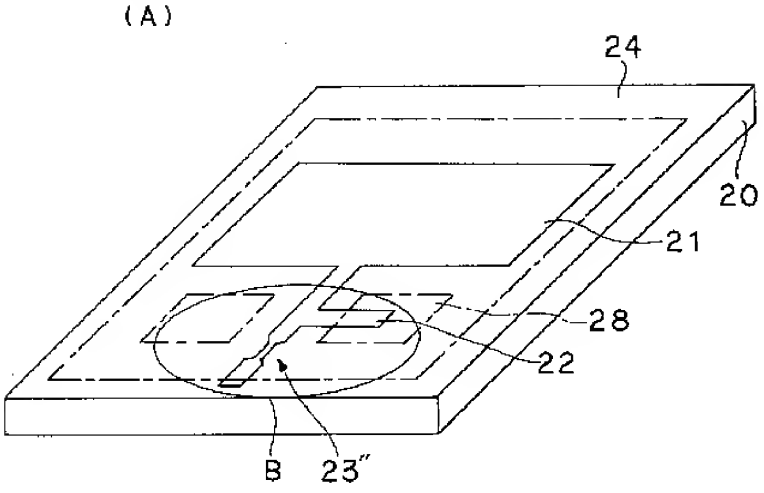
[Drawing 11]

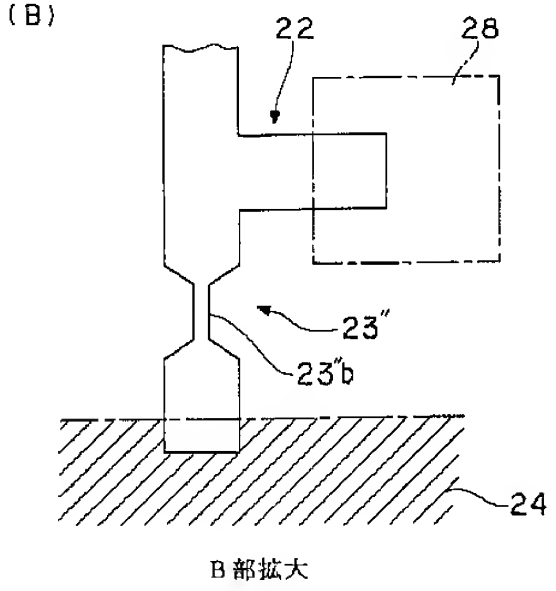


[Drawing 12]



[Drawing 9]

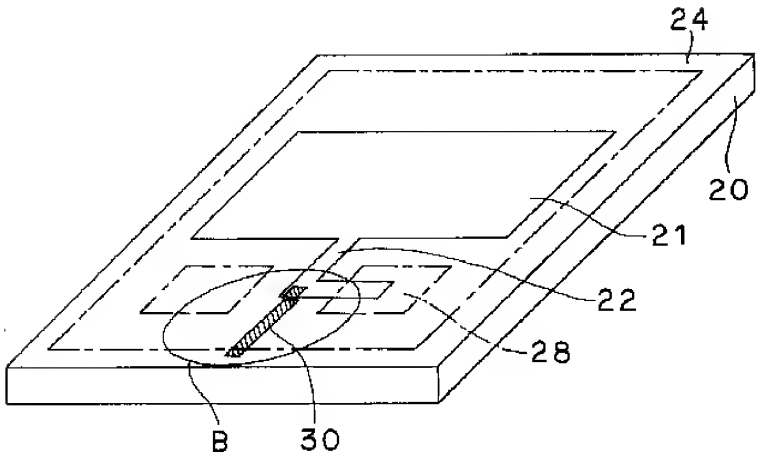




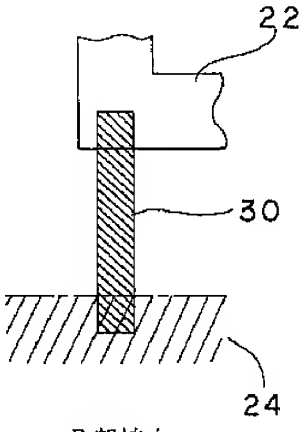
B 部拡大

[Drawing 10]

(A)

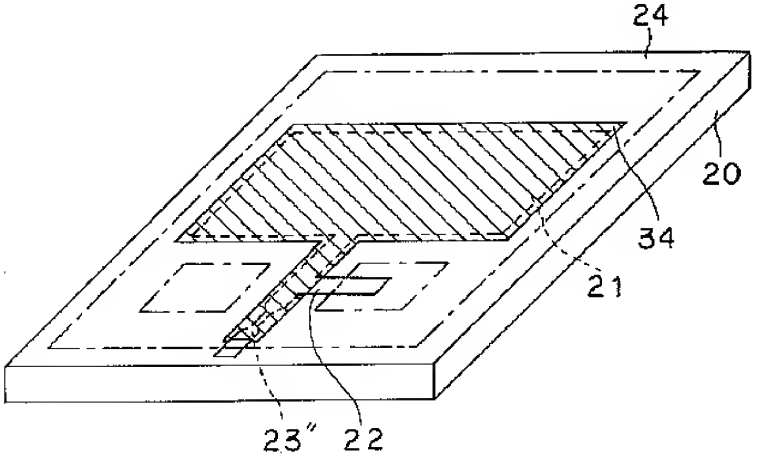


(B)

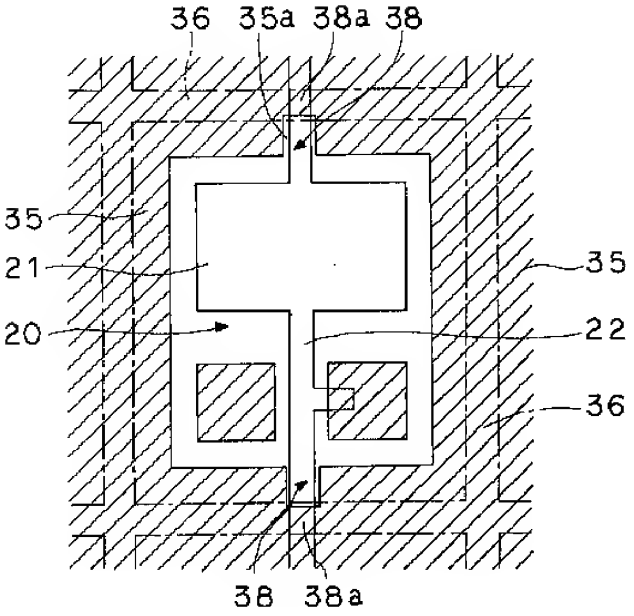


B部拡大

[Drawing 15]

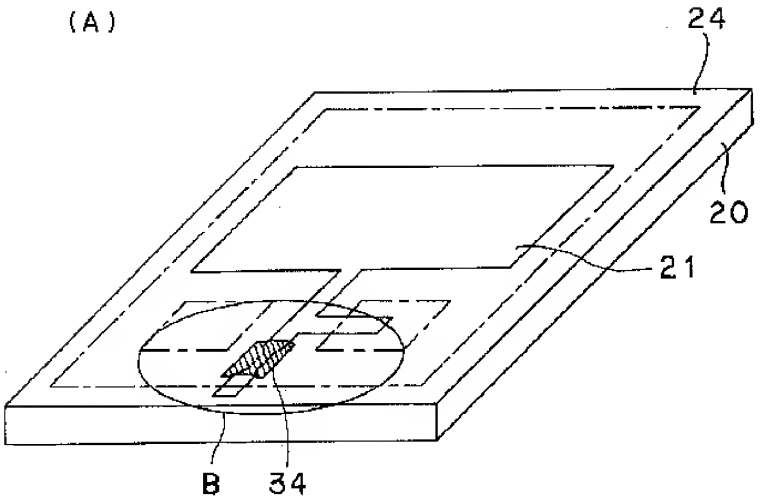


[Drawing 16]

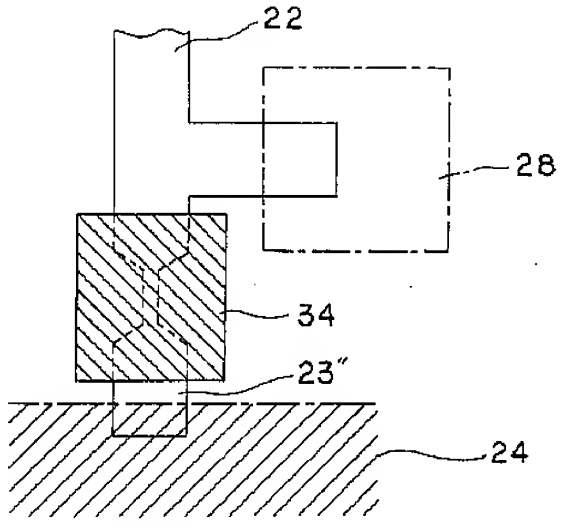


[Drawing 14]

(A)

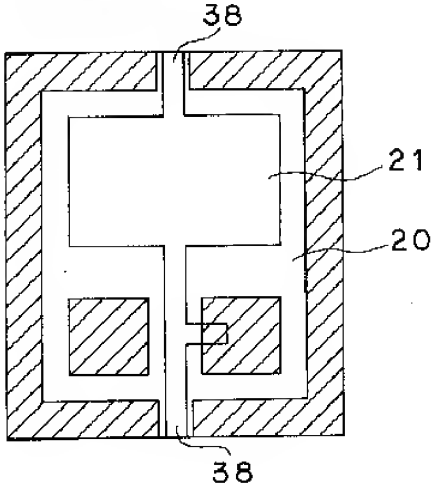


(B)



B部拡大

[Drawing 17]



[Drawing 18]